

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-221588

(43)Date of publication of application : 11.08.2000

51)Int.Cl.

G03B 21/00

G02B 7/18

H04N 5/74

(1)Application number : 11-025345

(71)Applicant : SEIKO EPSON CORP

(2)Date of filing : 02.02.1999

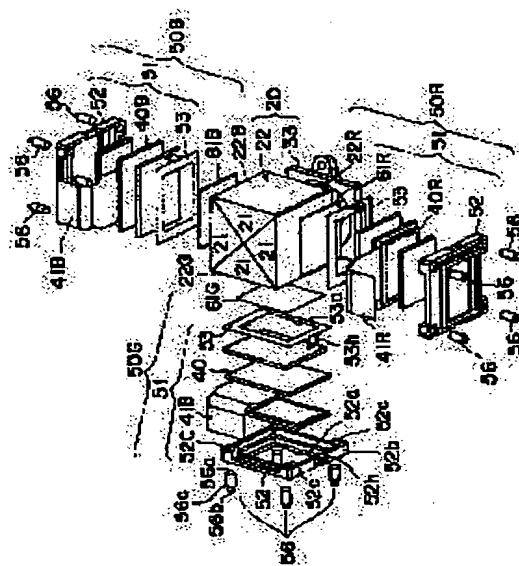
(72)Inventor : FUJIMORI MOTOYUKI
KITABAYASHI MASASHI

(4) ELECTRO-OPTICAL DEVICE ATTACHING UNIT AND PROJECTION TYPE DISPLAY DEVICE USING IT

(7)Abstract:

PROBLEM TO BE SOLVED: To provide a projection type display device that can efficiently and highly accurately executed the positioning fixing work of a liquid crystal panel unit for a prism, and also that can be miniaturized.

SOLUTION: This projection type display device has a panel frame body 51 holding liquid crystal panels 40R, 40G and 40B and is provided with plural holes 52c in its periphery and a fixing pin 56 that has a flat part 56a on one end surface and also has a deformed part 56b at an end part on a side different from the side at which the flat part 56a is provided and is inserted into the hole 52c, and at which the light incident plane of a prism optical combined body 22 and the flat part 56a of the fixing pin 56 are fixed with an adhesive and the inside of the hole 52c of the panel frame body 51 and the outer peripheral surface 56c of the fixing pin 56 are fixed with the adhesive.



LEGAL STATUS

Date of request for examination]

06.02.2003

Date of sending the examiner's decision of rejection]

Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

Date of final disposal for application]

Patent number]

Date of registration]

Number of appeal against examiner's decision of rejection]

Date of requesting appeal against examiner's decision of rejection]

Date of extinction of right]

NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

This document has been translated by computer. So the translation may not reflect the original precisely.

**** shows the word which can not be translated.

In the drawings, any words are not translated.

LAIMS

Claim(s)]

Claim 1] Electro-optics equipment which modulates light. The prism with which the aforementioned electro-optics equipment is attached, and the projection lens which projects the modulated light. the electro-optics equipment frame with which it was the projected type display equipped with the above, and the aforementioned electro-optics equipment as held and two or more holes were prepared in the circumference, and one end face -- a flat part -- having -- the above -- the lock-pin inserted in a hole -- having -- the optical plane of incidence of the aforementioned prism, and the aforementioned flat part of the aforementioned lock-pin -- adhesives -- fixing -- and the hole of the aforementioned electro-optics equipment frame -- the interior and the peripheral face of the aforementioned lock-pin fix with adhesives, and

Claim 2] Projected type display according to claim 1 characterized by the outline of the aforementioned electro-optics equipment frame being the same as the periphery of the optical plane of incidence of the aforementioned prism, or there being inside it.

Claim 3] the aforementioned electro-optics equipment frame -- an abbreviation rectangle -- it is -- the above -- the claim 1 characterized by preparing the hole in the four corners of this electro-optics equipment frame, or projected type display given in either of 2

Claim 4] For the side in which the aforementioned flat part is prepared, the aforementioned lock-pin is projected type display according to claim 1 to 3 characterized by having had the variant section at the edge of a different side, and this variant section having projected from the front face of the aforementioned electro-optics equipment frame.

Claim 5] The aforementioned lock-pin is projected type display according to claim 1 to 4 characterized by being the slack type configuration where the center section swelled.

Claim 6] The aforementioned lock-pin is projected type display according to claim 1 to 4 characterized by being the configuration where the center section became thinner than both ends.

Claim 7] Projected type display according to claim 1 to 6 characterized by being the configuration by which the circumference of the aforementioned flat part of the aforementioned lock-pin was beveled.

Claim 8] Projected type display according to claim 1 to 6 characterized by establishing a slot in the peripheral face by the side of the aforementioned flat part of the aforementioned lock-pin.

Claim 9] the following -- having -- the optical plane of incidence of the aforementioned prism, and the aforementioned flat part of the aforementioned lock-pin -- adhesives -- fixing -- and the hole of the aforementioned electro-optics equipment frame -- the electro-optics equipment installation unit characterized by fixing the interior and the peripheral face of the aforementioned lock-pin with adhesives The electro-optics equipment frame with which it was an electro-optics equipment installation unit for attaching in prism the electro-optics equipment which modulates light, and the aforementioned electro-optics equipment was held and two or more holes were prepared in the circumference. one end face -- a flat part -- having -- the above -- the lock-pin inserted in a hole

Claim 10] the aforementioned electro-optics equipment frame -- an abbreviation rectangle -- it is -- the above -- the electro-optics equipment installation unit according to claim 9 characterized by preparing the hole in the four corners of this electro-optics equipment frame

Claim 11] For the side in which the aforementioned flat part is prepared, the aforementioned lock-pin is the claim 9 characterized by having had the variant section at the edge of a different side, and this variant section having projected from the front face of the aforementioned electro-optics equipment frame, or an electro-optics equipment installation unit given in either of 10.

Claim 12] The aforementioned lock-pin is an electro-optics equipment installation unit according to claim 9 to 11 characterized by being the slack type configuration where the center section swelled.

Claim 13] The aforementioned lock-pin is an electro-optics equipment installation unit according to claim 9 to 11

characterized by being the configuration where the center section became thinner than both ends.

Claim 14] The electro-optics equipment installation unit according to claim 9 to 13 characterized by being the configuration by which the circumference of the aforementioned flat part of the aforementioned lock-pin was beveled.

Claim 15] The electro-optics equipment installation unit according to claim 9 to 13 characterized by establishing a slot the peripheral face by the side of the aforementioned flat part of the aforementioned lock-pin.

translation done.]

NOTICES *

Japan Patent Office is not responsible for any images caused by the use of this translation.

This document has been translated by computer. So the translation may not reflect the original precisely.

**** shows the word which can not be translated.

In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

The technical field to which invention belongs] this invention takes electro-optics equipments, such as a liquid crystal panel, through a dichroic prism or prism like a polarization beam splitter, and relates to the unit of a **** sake, and the projected type display which comes to use it.

[0002]

[Description of the Prior Art] The example of the conventional projected type display which attached electro-optics equipments, such as a liquid crystal panel, in prism relevant to the invention in this application is indicated by JP,10-10994,A. Then, the technology indicated by JP,10-10994,A is briefly explained based on the decomposition block diagram of drawing 9.

[0003] Liquid crystal panel unit 70R is attached in optical plane-of-incidence 72R of the prism composition object 72 of projected type display. This panel unit 70R consists of middle frames 77 arranged at optical plane-of-incidence 72R of the prism composition object 72 in the middle of the fixed frame object 76 of the maximum inside by which adhesion fixation is carried out, the panel frame 73 of the maximum outside which carries out receipt maintenance of the liquid crystal panel 80R, and the fixed frame object 76 and the panel frame 73. The panel frame 73 has the 1st frame 74 and the 2nd frame 75, and further, after liquid crystal panel 80R has been put by these frames 74 and 75, it holds them.

[0004] and the engagement to which engagement protruding piece 77b which protruded outside from the four corners of the middle frame 77 was formed in the four corners of the panel frame 73 (the 1st frame 74) -- a hole -- while adhesion fixation is carried out at 74b, the spacer 78 of an abbreviation triangle pole configuration is made to infix between the middle frame 77 and the panel frame 73, and it is made to carry out adhesion fixation of the middle frame 77 and the panel frame 73. Below, the flow view showing the process which obtains this composition in drawing 10 explains.

[0005] That is, first, the fixed frame object 76 is positioned to optical plane-of-incidence 72R of the prism composition object 72, and adhesion fixation is carried out with adhesives (S1). And the middle frame 77 is positioned on the outside of this fixed frame object 76 that carried out adhesion fixation, and four screw threads 79 are ****ed, and it inserts and fixes to Holes 77a and 76a (S2).

[0006] the engagement prepared in the 1st frame 74 of the panel frame 73 with which receipt maintenance of the liquid crystal panel 80R is carried out after an appropriate time -- a hole -- the inside of 74b -- adhesives -- loading -- this engagement -- a hole -- the middle frame 77 is equipped with the panel frame 73 by making engagement protruding piece 77b of the middle frame 77 insert in 74b (S3)

[0007] Next, liquid crystal panel 80R is made to turn on in this state, and (S4), focal adjustment of liquid crystal panel 80R, and alignment adjustment are performed (S5, S6). Process S4-S6 are performed in order to adjust positions, such as a position on the optical axis of liquid crystal panel 80R, and an inclination to this.

[0008] next, engagement -- a hole -- the adhesives with which 74b was loaded are hardened and temporary fixation of the middle frame 77 and the panel frame 73 is performed (S7) Then, the amount of gaps of the position of the pixel of liquid crystal panel 80R is checked (S8). Consequently, when the amount of gaps is over tolerance, the panel frame 73 is removed (when poor) (S13), and it returns to the above-mentioned process S3.

[0009] On the other hand, when the amount of gaps is in tolerance, adhesives are applied to a spacer 78 and a part for the predetermined interior of a proposal formed between the middle frame 77 by which temporary fixation was carried out, and the panel frame 73 is equipped with (S9) and this (S10). (when good) And actual fixation of the panel frame 73 is carried out to the prism composition object 72 by stiffening the adhesives between a spacer 78, the panel frame 73, and the middle frame 77 (S11).

010]

Problem(s) to be Solved by the Invention] however, the fixed frame board which is fixed to prism in the case of the above-mentioned conventional equipment -- the screw thread for fixation -- in order to secure a hole, it has projected from the prism periphery, and it had checked the miniaturization of equipment Moreover, since it was the structure which needs a fixed frame board and a middle frame board, the further miniaturization of a prism unit was barred. Furthermore, the process accompanying many fixed meanses, such as a spacer, adhesives, etc. which carry out actual fixation of the salient of the middle frame board for carrying out temporary fixation of the screw thread, panel frame, and middle frame board for fixing a fixed frame board and a middle frame board, the hole of a panel frame, and a panel frame and a middle frame, and it is needed for fixation through the prism of a liquid crystal panel unit, and there was room of an improvement also from a viewpoint of working efficiency or positioning accuracy.

011] Then, it is going to attain miniaturization of equipment, simple increase in efficiency of the fixed work of a photosynthesis means and electro-optics equipment, and highly precise-ization of positioning by replacing this invention with the conventional fixed frame board and conventional spacer with which fixation with electro-optics equipment and prism was presented, and proposing the projected type display which can fix these only with some lock-pins and adhesives.

012]

Means for Solving the Problem and its Function] The following meanses are used for this invention in order to attain the above-mentioned purpose.

013] The electro-optics equipment which modulates light, and the prism with which the aforementioned electro-optics equipment is attached, The electro-optics equipment frame with which it was the projected type display which is the projection lens which projects the modulated light, and the aforementioned electro-optics equipment was held and two or more holes were prepared in the circumference, one end face -- a flat part -- having -- the above -- the lock-pin inserted in a hole -- having -- the optical plane of incidence of the aforementioned prism, and the aforementioned flat part of the aforementioned lock-pin -- adhesives -- fixing -- and the hole of the aforementioned electro-optics equipment frame -- the interior and the peripheral face of the aforementioned lock-pin are fixed with adhesives Moreover, the electro-optics equipment frame with which it was an electro-optics equipment installation unit for attaching in prism the electro-optics equipment which modulates light, and the aforementioned electro-optics equipment was held and two or more holes were prepared in the circumference, one end face -- a flat part -- having -- the above -- the lock-pin inserted in a hole -- having -- the optical plane of incidence of the aforementioned prism, and the aforementioned flat part of the aforementioned lock-pin -- adhesives -- fixing -- and the hole of the aforementioned electro-optics equipment frame -- the interior and the peripheral face of the aforementioned lock-pin are fixed with adhesives

014] Since the fixed frame board projected from the circumference of prism becomes unnecessary conventionally according to these, the miniaturization of the part equipment is attained and, moreover, it also becomes possible to narrow the crevice between prism and an electro-optics equipment frame to the suitable range (less than 3mm, specially preferably 1-2mm). furthermore, attachment parts -- cutting down -- and a lock-pin -- a hole -- since it is placed inside, the positioning workability of an electro-optics equipment frame also becomes easy, and its fixed workability of the electro-optics equipment to prism improves In addition, the experiment also showed removal from the prism of a lock-pin, and that it could carry out easily.

015] Moreover, the outline of the aforementioned electro-optics equipment frame is the same as the periphery of the optical plane of incidence of the aforementioned prism, or it is made for there to be inside it. According to this, electro-optics equipment can be fixed by the inside of the periphery of prism, and the miniaturization of equipment is attained according to the size of prism. moreover, the aforementioned electro-optics equipment frame -- an abbreviation rectangle -- it is -- the above -- a hole is prepared in the four corners of this electro-optics equipment frame Since it is uniformly fixed to the circumference while according to this electro-optics equipment can be fixed to prism by the equal force and highly precise positioning is attained, shock resistance also improves.

016] Moreover, the aforementioned lock-pin had the variant section at the edge of a different side from the side in which the aforementioned flat part is prepared, and this variant section has projected it from the front face of the aforementioned electro-optics equipment frame. According to this, insertion etc. can do a lock-pin in the hole of an electro-optics equipment frame easily at chucking etc. using the variant section, and the positioning can also be performed easily. Moreover, the aforementioned lock-pin is made into the slack type configuration where the center section swelled. Corresponding to image surface distortion of a projection lens, by using the center section of the lock-pin as the supporting point, an electro-optics equipment frame can move freely and, according to this, positioning of electro-optics equipment becomes still easier. Moreover, the aforementioned lock-pin is made into the configuration where the center section became thinner than both ends. According to this, since the spring nature of a lock-pin

improves in a center section, in this portion, the stress which joins the joint of electro-optics equipment and prism from difference of coefficient of thermal expansion can be mitigated, and pixel gap can be reduced.

017] Furthermore, the circumference of the flat part of the aforementioned lock-pin is beveled, or a slot is established the peripheral face by the side of this flat part. According to these, it becomes possible to prevent the flow of the adhesives from a lock-pin to a lower part.

018]

[Embodiments of the Invention] Next, the suitable example of this invention is explained with reference to an accompanying drawing.

019] The appearance of the projected type display which applied the method concerning this invention to drawing 1 is shown. The sheathing case 2 of the projected type display 1 of this example is carrying out the rectangular parallelepiped configuration. Fundamentally, this sheathing case 2 consists of an upper case 3, a lower case 4, and a front case 5 where the front face of equipment is specified. And from the center of the front case 5, the portion by the side of the nose of cam of the projection lens unit 6 has projected.

020] Arrangement of each component in the interior of the sheathing case 2 of the projected type display 1 is shown drawing 2. As shown in this drawing, in the interior of the sheathing case 2, the power supply unit 7 is arranged at the back end side. The light source lamp unit 8 and the optical unit 9 are arranged in the position which adjoined the equipment anterior rather than this. Furthermore, the end face side of the projection lens unit 6 is located in the center of the anterior of the optical unit 9.

021] On the other hand, the interface substrate 11 in which the input/output interface circuit was carried towards the equipment cross direction is arranged, and the video substrate 12 in which the video signal processing circuit was carried is arranged in parallel with this at one optical unit 9 side. Furthermore, the control board 13 for equipment drive control is arranged at the light source lamp unit 8 and optical unit 9 bottom, and Loudspeakers 14R and 14L are arranged at the angle of right and left by the side of the equipment front end, respectively.

022] The inhalation-of-air fans 15A and 15B for equipment internal intercooling are stationed at the upper part of the optical unit 9, and the lower part. Moreover, the ventilating fan 16 is arranged at the equipment side which is the rear side of the light source lamp unit 8. And the auxiliary cooling fan 17 for attracting the airstream for cooling from inhalation-of-air fan 15A in a power supply unit 7 is arranged in the position facing the edge of the substrates 11 and 12 in a power supply unit 7.

023] Fan 15B is mainly functioning among these fans as a fan the liquid crystal panels 40R and 40G mentioned later and 40B cooling. In addition, fan 15A can also be used for cooling of liquid crystal panels 40R, 40G, and 40B.

024] Hereafter, based on drawing 3, the composition of the optical unit 9 and optical system is explained.

025] The portion of the optical unit 9 is shown in drawing 3 (A). As shown in this drawing, the optical unit 9 has the composition that optical elements other than prism unit 20 which constitutes the color composition means were inserted and held from the upper and lower sides between the up-and-down light guides 901,902. The upper light guide 901 and the lower light guide 902 are being fixed to the upper case 3 and lower case 4 side by the lock screw, respectively. Moreover, the light guide 901,902 of these upper and lower sides is being fixed by the lock screw as well to the prism unit 20 side.

026] The prism unit 20 is being fixed to the rear face of the thick head board 30 which is a dies casting board by the lock screw. Similarly the end face side of the projection lens unit 6 as a projection means is being fixed to the front face of this head board 30 by the lock screw. Therefore, in this example, the head board 30 is inserted and it has structure fixed so that the prism unit 20 and the projection lens unit 6 might be united.

027] The outline composition of the optical system built into the projected type display 1 is shown in drawing 3 (B). The uniform lighting optical system 923 with which the optical system of this example has the light source lamp 805 and the integrator lens 921,922 it is [lens] a uniform lighting optical element, The color separation optical system 924 which separates into red, green, and each blue colored light bunches R, G, and B the flux of light W by which outgoing radiation is carried out from this lighting optical system 923, It consists of liquid crystal panels 40R, 40G, and 40B of three sheets as electro-optics equipment which modulates each colored light bunch, a prism composition object 22 as a Narimitsu study system which compounds the modulated colored light bunch, and a projection lens unit 6 that carries out expansion projection of the compounded flux of light on a projection side. Moreover, it has the relay optical system 927 which leads the blue flux of light B to corresponding liquid crystal panel 40B among each colored light bunch separated by the color separation optical system 924.

028] The uniform lighting optical system 923 is equipped with the reflective mirror 931, and optical-axis 1a of the outgoing radiation light from the light source lamp 805 is turned to equipment front, and it is made to bend it right-angled further. This mirror 931 is pinched and it is arranged at the state where the integrator lens 921,922 intersects perpendicularly forward and backward.

1029] The color separation optical system 924 consists of a bluish green reflective dichroic mirror 941, a green reflective dichroic mirror 942, and a reflective mirror 943. First, in the bluish green reflective dichroic mirror 941, the blue flux of light B included there among the flux of lights W which passed along the uniform lighting optical system 23, and the green light bunch G are reflected right-angled, and it goes to the green reflective dichroic mirror 942 side. This mirror 941 is passed, it is reflected right-angled by the back reflective mirror 943, and outgoing radiation of the red flux of light R is carried out to a tone Narimitsu study system side from the outgoing radiation section 944 of the red flux of light. Next, in the green reflective dichroic mirror 942, the green light bunch G is reflected right-angled among the blue and the green flux of lights B and G which were reflected in the mirror 941, and outgoing radiation is carried out to a tone Narimitsu study system side from the outgoing radiation section 945 of a green light bunch. Outgoing radiation of the blue flux of light B which passed this mirror 942 is carried out to the relay optical-system 27 side from the outgoing radiation section 946 of the blue flux of light. In this example, it is set up so that all the distance from the outgoing radiation section of the flux of light of a uniform lighting optical element to the outgoing radiation section 944,945,946 of each colored light bunch in the color separation optical system 924 may become most equal.

1030] The condenser lens 951,952 is arranged at the outgoing radiation side of the outgoing radiation section 944,945 of the red flux of light of the color separation optical system 924, and a green light bunch, respectively. Therefore, incidence of the red flux of light and the green light bunch which carried out outgoing radiation from each outgoing radiation section is carried out to these condenser lenses 951,952, and they are parallel-ized.

1031] After, as for the red and the green flux of lights R and G which were parallel-ized, the polarization direction is ranged by polarizing plates 60R and 60G, incidence is carried out to liquid crystal panels 40R and 40G, it becomes regular, and the image information corresponding to each colored light is added. That is, switching control of these liquid crystal panels 40R and 40G is carried out according to the picture signal corresponding to image information by the driving means which are not illustrated, and, thereby, the modulation of each colored light which passes through this is performed. Such driving means can use a well-known means as it is.

1032] On the other hand, the blue flux of light B is led to liquid crystal panel 40B which corresponds after the polarization direction arranged by polarizing plate 60B further through the relay optical system 927, and a modulation similarly given in here according to image information. In addition, what used for example, the polysilicon contest FT as a switching element can be used for the liquid crystal panels 40R, 40G, and 40B of this example.

1033] The relay optical system 927 consists of a condenser lens 974, the incidence side reflective mirror 971, an outgoing radiation side reflective mirror 972, a middle lens 973 arranged among these mirrors, and a condenser lens 953 arranged to the near side of liquid crystal panel 40B. The blue flux of light B becomes the longest, therefore the quantity of light loss of this flux of light of distance from the length 805, i.e., the light source lamp, of an optical path of each colored light bunch to each liquid crystal panel increases most. However, quantity of light loss can be suppressed by making the relay optical system 927 intervene.

1034] Incidence of each colored light bunch modulated through each liquid crystal panels 40R, 40G, and 40B is carried out to polarizing plates 61R, 61G, and 61B, incidence of the light which penetrated this is carried out to the prism composition object 22, and it is compounded here. The tone Narimitsu study system consists of these examples using the prism composition object 22 which consists of a dichroic prism. Expansion projection of the color picture compounded here is carried out on the projection side 7 in a position through the projection lens unit 6.

1035] Hereafter, based on drawing 4, the structure of the prism unit 20 and the head board 30 is explained.

1036] The head board 30, and the prism unit 20 and the liquid crystal panel units 50R, 50G, and 50B attached in this head board 30 are taken out in drawing 4, and it is shown in it. As shown in this drawing, the head board 30 consists of fundamentally a perpendicular wall 31 prolonged with a perpendicular posture towards the cross direction of equipment, and a bottom wall 32 horizontally prolonged from the soffit of this perpendicular wall 31. Opening 31b of the rectangle for the outgoing radiation light from the prism unit 20 passing is formed in the perpendicular wall 31. Moreover, many reinforcing ribs are formed in this perpendicular wall 31, and the rigidity is raised to it. Where alignment of this perpendicular wall 31 is inserted and carried out, the prism unit 20 and the projection lens unit 6 are being fixed (refer to drawing 3 (A)). Therefore, such integrity is high, and even if impulse force etc. acts, there are very few possibilities that a mutual position gap may occur.

1037] The prism unit 20 is installed in the upper surface of the bottom wall 32 of the head board 30. The prism unit 20 is equipped with the prism composition object 22 and the prism support plate 33 of the rectangular parallelepiped configuration constituted by joining those slant faces mutually in four prism 21 which carried out the cross section of an abbreviation rectangular equilateral triangle (refer to drawing 5). It is being fixed to the front face of the prism support plate 33 by meanses, such as adhesion, and the prism support plate 33 attaches the pars basilaris ossis occipitalis of the prism composition object 22 in the bottom wall 32 of a head board, and it is being fixed. Each liquid

ystal panel units 50R, 50G, and 50B equipped with liquid crystal panels 40R, 40G, and 40B are attached in the side of the three way type which functions as optical plane of incidence among the sides of the prism composition object 2, respectively.

[038] Next, based on the decomposition block diagram of the liquid crystal panel unit of drawing 5, the composition of the liquid crystal panel units 50R, 50G, and 50B which make the feature of this operation gestalt attached in the prism unit 20 (or prism composition object 22) is explained.

[039] In addition, since the liquid crystal panel units 50R, 50G, and 50B are the same composition, below, they are explained focusing on liquid crystal panel unit 50G. However, with the angle of drawing, in being legible, it also refers to the unit of 50R and 50B.

[040] Liquid crystal panel unit 50G are equipped with the panel frame (electro-optics equipment frame) 51 which is carrying out receipt maintenance of the liquid crystal panel 40G which are electro-optics equipment inside. This panel frame 51 is equipped with the 1st frame 52 arranged at a light source side (outside), and the 2nd frame 53 arranged at the prism composition object 22 side (inside), and has the structure where liquid crystal panel 40G were pinched among these frames.

[041] Furthermore, the panel frame 51 has the size (appearance) settled in optical plane-of-incidence 22G of the prism composition object 22, and the lock-pin 56 is inserted in the four corners. Positioning fixation of the panel frame 51 is carried out through these lock-pin 56 and adhesives optical plane-of-incidence 22G of the prism composition object 22. In addition, the structure of a lock-pin 56 is explained in full detail behind. Moreover, the member prolonged towards the upper part from the panel frame 51 is flexible cable 41G for wiring.

[042] The 1st frame 52 is a rectangular frame at the basic target which rectangle opening 52a was formed in the inside field, and had peripheral wall 52b of fixed thickness. the hole which can penetrate a lock-pin 56 in the four corners of 52h of engagement slots which there is a space which contains a liquid crystal panel inside peripheral wall 52b, and engage with the 2nd frame 53 at the right-and-left side of peripheral wall 52b, and peripheral wall 52b -- 52c is prepared, respectively a hole -- 52c is taken as the size which also has the crevice where adhesives enter between the lock-pins 56 to penetrate In addition, if the 1st frame 52 is used as the mold goods of the thermosetting resin which fixed the carbon fiber or the calcium carbonate, the coefficient of thermal expansion will become glass which constitutes prism compared with a general resin material closely. For this reason, the pixel gap which originated in heat deformation in the state where it fixed to the prism composition object 22 can be reduced.

[043] The 2nd frame 53 is for holding the liquid crystal panel contained by the 1st frame 52, and is a frame of a circular with which rectangle opening 53a was formed in the inside field. Hook 53h which engages with 52h of engagement slots of the 1st frame 52 is formed in the right-and-left outside of the 2nd frame 53.

[044] The 1st frame 52 and the 2nd frame 53 sandwich liquid crystal panel 40G, fit in by the 52h of the above-mentioned engagement slots, and hook 53h, and constitute the panel frame 51. in this case, the hole of the 1st frame 52 -- 52c -- the outside of the periphery of the liquid crystal panel 40G and 2nd frames 53 -- being located -- making -- a lock-pin 56 -- a hole -- it is made not to become an obstacle penetrating 52c and reaching the prism composition object 2

[045] In addition, the structure of the panel frame 51 is not restricted to this example, and fundamentally, a liquid crystal panel can be held and it should just have the grade which is stabilized in a liquid crystal panel and can fix the leakthrough for lock-pin 56 to the prism composition object 22, and the structure with which the circumference was equipped.

[046] Next, the means of attachment to the prism unit 20 of the liquid crystal panel units 50R, 50G, and 50B are explained in detail, referring to the anchoring flow of a liquid crystal panel unit shown in drawing 6.

[047] First, polarizing plates 61R, 61G, and 61B are stuck on the optical plane of incidence 22R, 22G, and 22B of the prism composition object 22 of the prism unit 20 (process S1 of drawing 6). on the other hand, the hole of the panel frame 51 -- the interior of 52c and the lock-pin 56 are degreased by alcohol etc. (drawing 6 processes S2 and S3)

[048] Next, adhesives are applied to flat part 56a and peripheral face 56c of a lock-pin 56 (process S4 of drawing 6). and variant section 56b from which the flat part 56a was made into the prism side, and the other end projected the lock-pin 56 -- using -- chucking -- carrying out -- the hole of the panel frame 51 -- it inserts in 52c (process S5 of drawing 6) And the optical plane of incidence 22R, 22G, and 22B of the prism composition object 22 is equipped with the panel frame 51 equipped with this lock-pin 56 using flat part 56a of a lock-pin 56 (process S6 of drawing 6). In this state, the prism composition object 22 is only equipped with the lock-pin 56 with the surface tension of the adhesives at the flat part 56a.

[049] Next, liquid crystal panels 40R, 40G, and 40B are made to turn on (process 7 of drawing 6). And focal adjustment is performed and the focal field of the liquid crystal panels 40R, 40G, and 40B pinched by the panel frame 51 in the focal side of the projection lens 6 is doubled (process S8 of drawing 6). This process S8 will adjust 3 shaft

orientations in the position (x) of the direction of a x axis, the inclination (xtheta) of the hand of cut on the basis of a x axis, the inclination (ytheta) of the hand of cut on the basis of the y-axis, and the sum total, if two shafts which intersect perpendicularly the optical axis of the projection lens unit 6 with the z-axis and this are made into a x axis and the y-axis. This adjustment is performed on the basis of near the liquid crystal layer of liquid crystal panels 40R, 40G, and 40B. A focal state is checked after focal adjustment (process S9 of drawing 6), if the result of focal adjustment is poor, it will return to a process S8 and focal adjustment will be performed again.

1050] In process S9, if the result of focal adjustment is good, alignment adjustment will be performed and the position of the pixel of liquid crystal panels 40R, 40G, and 40B will be united (process S10 of drawing 6). This process S10 will adjust 3 shaft orientations in the position (x) of the direction of a x axis of liquid crystal panels 40R, 40G, and 40B, the position (y) of the direction of y and the inclination (ztheta) of the hand of cut on the basis of the z-axis, and the sum total, if two shafts which intersect perpendicularly the optical axis of the projection lens unit 6 with the z-axis and this are made into a x axis and the y-axis. Although it is desirable to carry out on the basis of one of pixels among three liquid crystal panels 40R, 40G, and 40B, you may perform alignment adjustment independently, respectively.

1051] while performing focal adjustment and alignment adjustment lock-pin 56 -- the surface tension of adhesives -- a hole -- being held in between in 52c, the movement of the panel frame 51 by adjustment operation is followed, and the position and direction are changed. The amount of gaps of the pixel of each liquid crystal panels 40R, 40G, and 40B is checked after alignment adjustment (process S11 of drawing 6), when the amount of gaps is outside tolerance (poor), the cast away of the lock-pin 56 is removed and carried out (process S17 of drawing 6), it exchanges to the new lock-pin 56, and the process S3 or subsequent ones is repeated.

1052] On the other hand, in a process S11, when the amount of gaps of a pixel is in tolerance (good), primary hardening of adhesives is performed between a lock-pin 56, the prism composition object 22, and the panel frame 51 (process S12 of drawing 6). Here, when ultraviolet-rays hardening adhesives are used as adhesives, it hardens by carrying out predetermined-time irradiation of the ultraviolet rays in adhesives. Although time to irradiate these ultraviolet rays changes with the kinds and amounts of adhesives, it is usually for [dozens of seconds -] several minutes.

1053] Next, the amount of gaps of the pixel of each liquid crystal panels 40R, 40G, and 40B is checked again (process S13 of drawing 6). When the amount of gaps is outside tolerance (poor), like the case of a process S11, the cast away of the lock-pin 56 is carried out (process S17 of drawing 6), it exchanges to the new lock-pin 56, and the process S3 or subsequent ones is repeated.

1054] On the other hand, when the amount of gaps of a pixel is in tolerance (good), the hardening state of the adhesives between a lock-pin 56, the panel frame 51, and a lock-pin 56 and the prism composition object 22 is checked (process S14 of drawing 6). When a hardening state is poor, like the case of a process S14, the cast away of the lock-pin 56 is carried out (process S17 of drawing 6), it exchanges to the new lock-pin 56, and the process S3 or subsequent ones is repeated.

1055] On the other hand, when a hardening state is good, secondary hardening of the adhesives between a lock-pin 56, the panel frame 51, and a lock-pin 56 and the prism composition object 22 is performed (process S15 of drawing 6).

1056] In addition, although it is possible to also make hardening of adhesives complete only at 1 time of a hardening process, without performing secondary hardening, the direction which divided the hardening process into 2 times is desirable in the viewpoint of the improvement in a throughput like this operation form. Moreover, the direction which divided before dividing the hardening process into 2 times and performing secondary hardening like this operation form, made a judgment of an amount and a hardening state, and was made to redo when poor is desirable also from a viewpoint of the improvement in reliability. Furthermore, since it can redo before performing final secondary hardening, there is also an advantage from which removal of a lock-pin 56 becomes easy.

1057] After performing secondary hardening, the hardening state of the adhesives between a lock-pin 56, the panel frame 51, and the prism composition object 22 is checked again (process S16 of drawing 6). When a hardening state is poor, the cast away of the lock-pin 56 is carried out (process S17 of drawing 6), it exchanges to the new lock-pin 56, and the process S3 or subsequent ones is repeated. On the other hand, if the hardening state is good, the installation to the prism unit 20 of the liquid crystal panel units 50R, 50G, and 50B will be ended.

1058] The state where the liquid crystal panel units 50R, 50G, and 50B were attached and fixed to the prism unit 20 is shown in drawing 7. Since this projected variant section 56b can be used as a chuck when the panel frame 51 will be fixed or it will remove it to the prism unit 20 if variant section 56b of the back end of a lock-pin 56 is made to project from the front face of the panel frame 51 so that this drawing 7 may see, it is convenient.

1059] Here, a lock-pin 56 is explained in detail. the portion between variant section 56b which has the configuration which is located in the prism composition object 22 at the other end side of flat part 56a by which adhesion fixation is carried out, and flat part 56a, and is distinguished from other portions as the lock-pin 56 was already described, and flat

art 56a and variant section 56b -- a hole -- it comes to have peripheral face 56c fixed to the inside of 52c As a lock-pin 5 which has such an element, various configurations as shown in drawing 8 are possible.

060] Peripheral face 56c is used as a pillar, the nose of cam is made into a flat surface, and it is referred to as flat part 5a, and drawing 8 (A) is the thing in which convex type variant section 56b was formed, and is the most fundamental at the back end. Drawing 8 (B) considers as the slack type with which the center of the pillar of drawing 8 (A) swelled, and since it can move the panel frame 51 freely by using this center section as the supporting point according to this, positioning work becomes easier to do it.

061] Drawing 8 (C) makes the center section of the pillar of drawing 8 (A) thinner than the both ends, and has elasticity higher than ends for that. By 56d of this resilient part, the stress which joins jointing by the difference in a coefficient of thermal expansion can be absorbed, and pixel gap can be reduced by the temperature change.

062] The thing to which drawing 8 (D) beveled the circumference of flat part 56a of a lock-pin 56, and drawing 8 (E) establish a slot in peripheral face 56c by the side of flat part 56a of a lock-pin 56. According to these, it can prevent that adhesives turn to these chamfer 56e and 56f of slots, and adhesives flow caudad at the time of adhesion fixation. In addition, the size of 56f of slots and the number shall be suitably defined according to a situation.

063] Generally a glass thing can be used for such a lock-pin 56. However, when the 1st frame 52 is used as resin mold goods, since coefficient of thermal expansion is large compared with glass, that a lock-pin 56 tends to exfoliate from these frames by the difference in thermal expansion, it may become or a lock-pin 56 may be destroyed by the temperature change. In order to avoid these, it is desirable to use a lock-pin 56 as resin mold goods, such as acrylic.

064] Since a fabricating operation is possible by making a lock-pin 56 into the acrylic quality of the material, as compared with glass, cost reduction can be planned sharply. In addition, if the material which makes ultraviolet rays penetrate as a material of a lock-pin 56 is used, a temperature rise can use the few short ultraviolet-rays hardening type adhesives of the setting time as adhesives for carrying out adhesion fixation of the lock-pin 56.

065] Thus, according to this operation form, it is possible to stabilize and fix to the prism composition object 22 the panel frame 51 which held liquid crystal panels 40R, 40G, and 40B, respectively only using four lock-pins 56 and adhesives. moreover, positioning with each liquid crystal panels 40R, 40G, and 40B and the optical plane of incidence of the prism composition object 22 -- the hole of the panel frame 51 -- since it carries out along with peripheral face 5c of the lock-pin 56 which it was inserted in 52c and nose-of-cam flat part 56a pasted up on the optical plane of incidence of the prism composition object 22, moving the panel frame 51, the positioning operation becomes easier and, moreover, its positioning accuracy improves

066] As mentioned above, although this invention has been explained based on a concrete operation form, as long as various deformation and change are possible and it is in this technical thought, those deformation and change are also included in this invention, without limiting this invention to the above-mentioned operation form.

067] For example, the following change is also possible.

) Although the above-mentioned operation form explained the example at the time of applying this invention to the projected type display which used the penetrated type liquid crystal panel, this invention can be applied also to the projected type display which used the reflected type liquid crystal panel. Moreover, electro-optics equipment is not limited to a liquid crystal panel like the after-mentioned. Here, the "penetrated type" means that it is the type whose electro-optics equipments, such as a liquid crystal panel, penetrate light, and means that a "reflected type" is a type whose electro-optics equipments, such as a liquid crystal panel, reflect light. In the projected type display which adopted reflected type electro-optics equipment, while a dichroic prism like the prism composition object 22 is used as an optical separation means to divide light into the light of three colors of red, green, and blue, it may be used also as a photosynthesis means which compounds the light of three modulated colors and carries out outgoing radiation in the same direction. Moreover, a polarization beam splitter may be arranged between electro-optics equipment and a color composition means. In the case of the latter, it is possible to apply this invention to the composition which fixes electro-optics equipment to the field of this polarization beam splitter. When this invention is applied to reflected type projected type display, the almost same effect as penetrated type projected type display can be acquired.

068] (2) Moreover, electro-optics equipment may not be restricted to a liquid crystal panel (for example, liquid crystal light valve), for example, may be the equipment using the micro mirror, and CCD (charge-coupled device). Moreover, prism may not be restricted to the dichroic prism with which two kinds of colour-selection sides were formed along the adhesion side of four triangle pole-like prism like the prism composition object 22, but colour-selection sides may be one kind of dichroic prism, and a polarization beam splitter. In addition, prism may be what ranges an optical selective surface in the box of abbreviation hexahedron-like light-transmission nature, and was filled up with the liquid there.

069] (3) Although the front projection type display which performs projection, and the direction which observes a projection image have further the tooth-back projection type display which performs projection from an opposite side

projected type display from the direction which observes a projection image, the composition shown with the form of the above-mentioned implementation is applicable to the all.

[070]

[Effect of the Invention] According to the invention in this application, by performing fixation to the prism of the electro-optics equipment frame holding electro-optics equipment with adhesives through the lock-pin inserted in the hole prepared in the circumference of an electro-optics equipment frame, the fixed frame board attached in prism becomes unnecessary, and the miniaturization of equipment can be attained. Since the preparatory work accompanying is also becomes reducible simultaneously, it can contribute also to reduction of cost.

[071] Furthermore, at the time of further adjustment of electro-optics equipment or alignment adjustment, the nature of a lock-pin becomes good and can also attain the increase in efficiency of work of an assembly, and highly precise-ization of positioning.

[translation done.]

NOTICES *

pan Patent Office is not responsible for any
mages caused by the us of this translation.

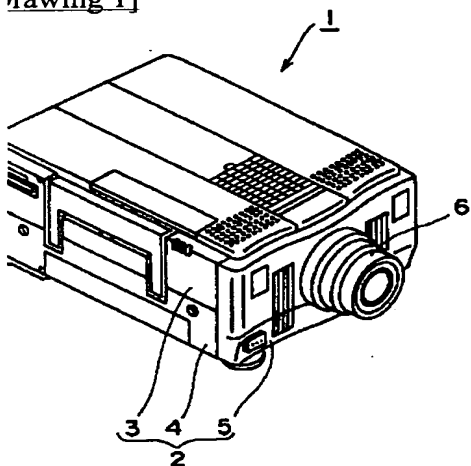
This document has been translated by computer. So the translation may not reflect the original precisely.

**** shows the word which can not be translated.

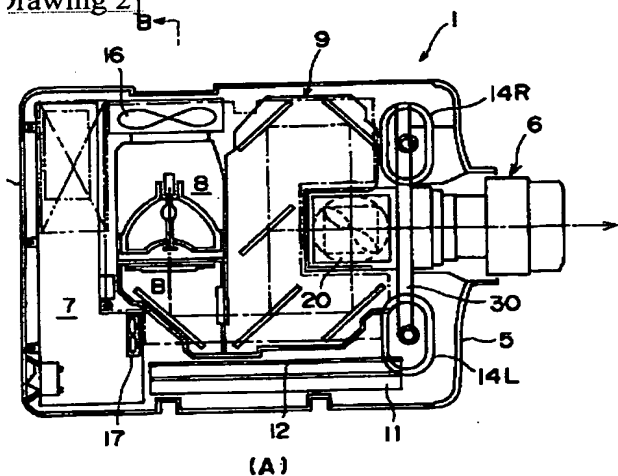
In the drawings, any words are not translated.

DRAWINGS

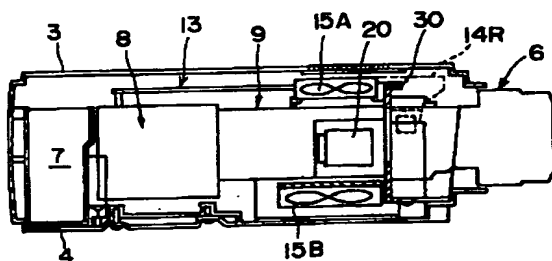
Drawing 1]



Drawing 2]

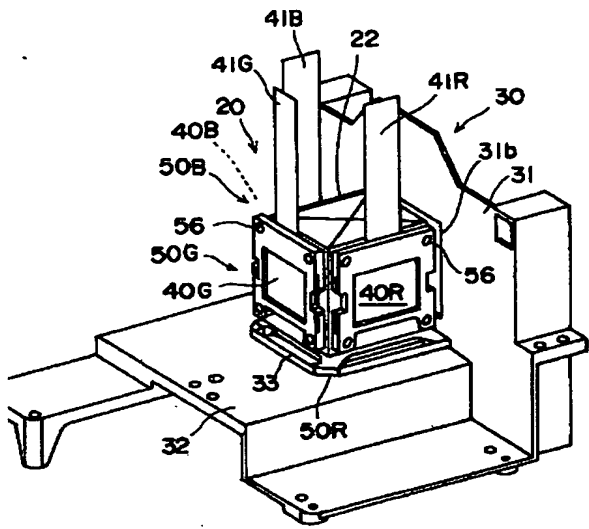


(A)

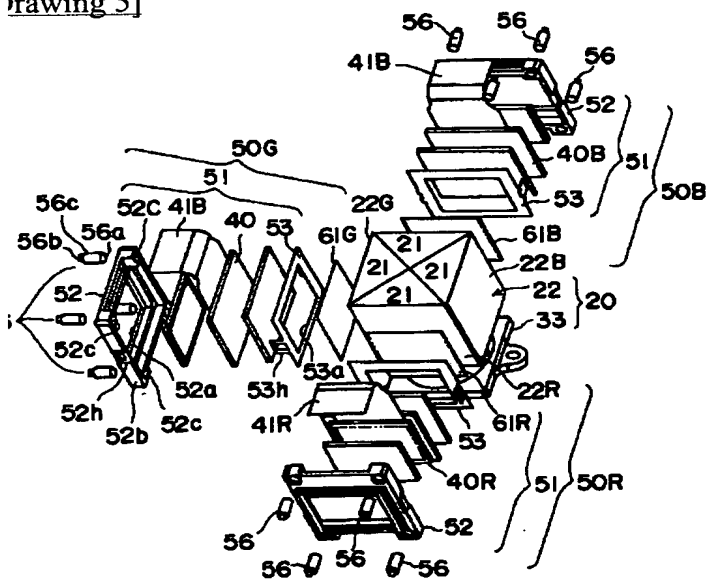


(B)

Drawing 4]



rawing 5]



rawing 3]

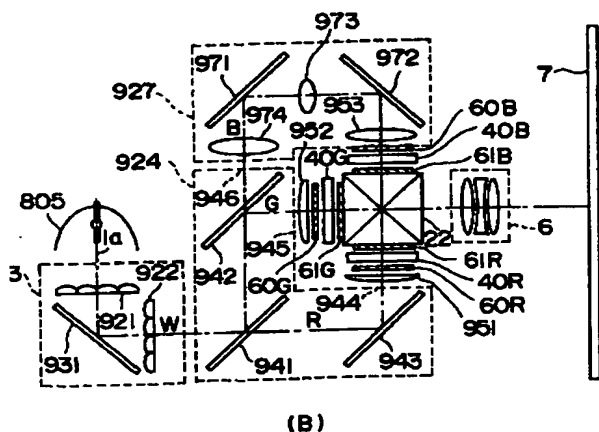
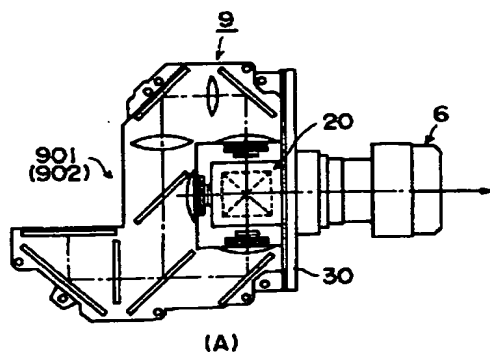


Figure 6

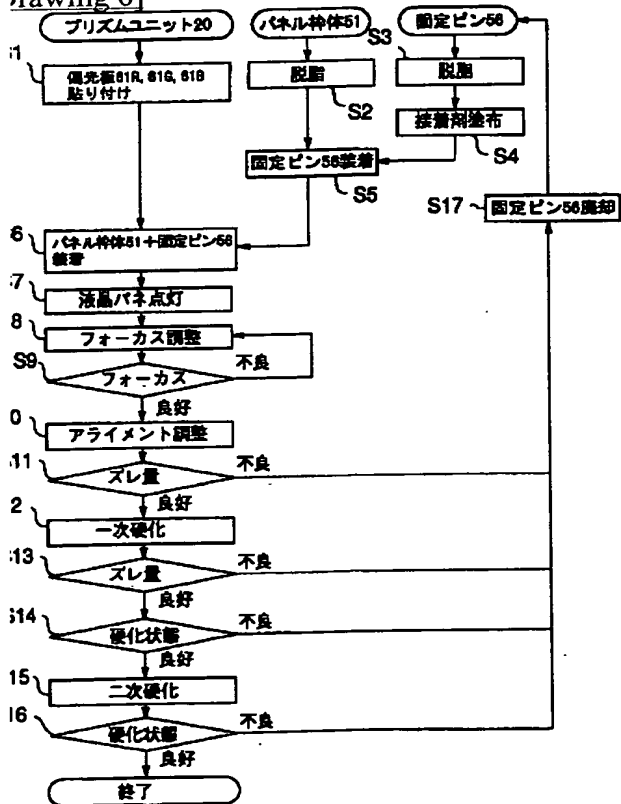
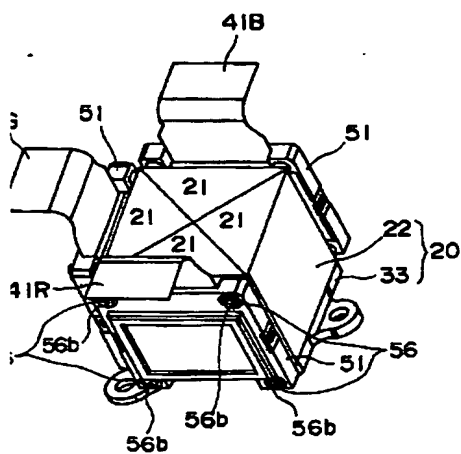
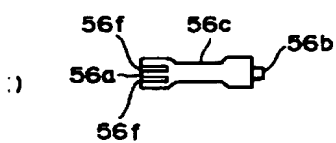
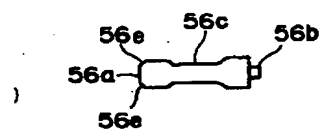
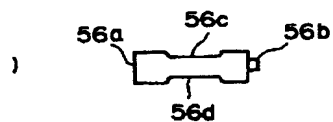
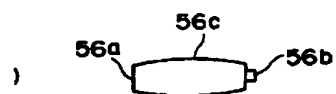
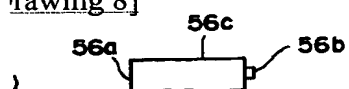


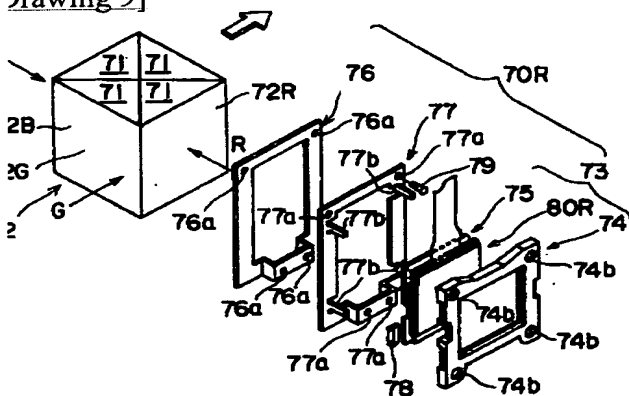
Figure 7



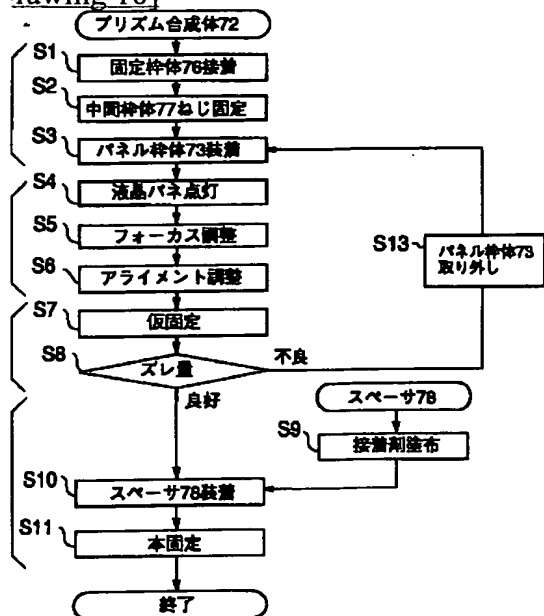
rawing 8]



Drawing 9]



rawing 10]



translation done.]

NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

This document has been translated by computer. So the translation may not reflect the original precisely.

**** shows the word which can not be translated.

In the drawings, any words are not translated.

CORRECTION or AMENDMENT

[Official Gazette Type] Printing of amendment by the convention of 2 of Article 17 of patent law.

[Section partition] The 2nd partition of the 6th section.

[Date of issue] May 21, Heisei 15 (2003. 5.21)

[Publication No.] JP,2000-221588,A (P2000-221588A)

[Date of Publication] August 11, Heisei 12 (2000. 8.11)

[*** format] Open patent official report 12-2216.

[Filing Number] Japanese Patent Application No. 11-25345.

[The 7th edition of International Patent Classification]

03B 21/00 .

02B 7/18 .

04N 5/74 .

I]

03B 21/00 D .

04N 5/74 B .

02B 7/18 A .

[Procedure revision]

[Filing Date] February 6, Heisei 15 (2003. 2.6)

[Procedure amendment 1]

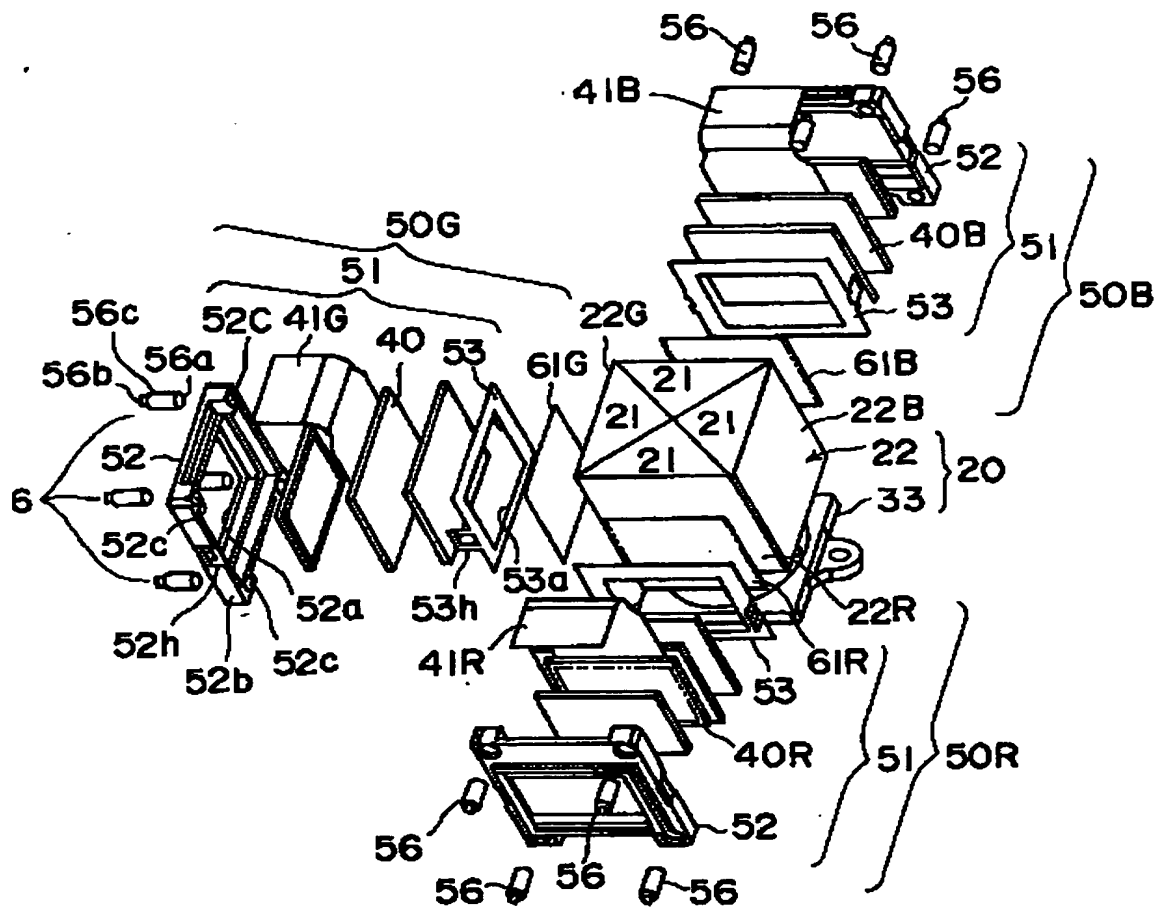
[Document to be Amended] DRAWINGS

[Item(s) to be Amended] Drawing 5.

[Method of Amendment] Change.

[Proposed Amendment]

[Drawing 5]



[translation done.]